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(54) CLEANING AND REMOVAL OF ORGANIC SUBSTANCE

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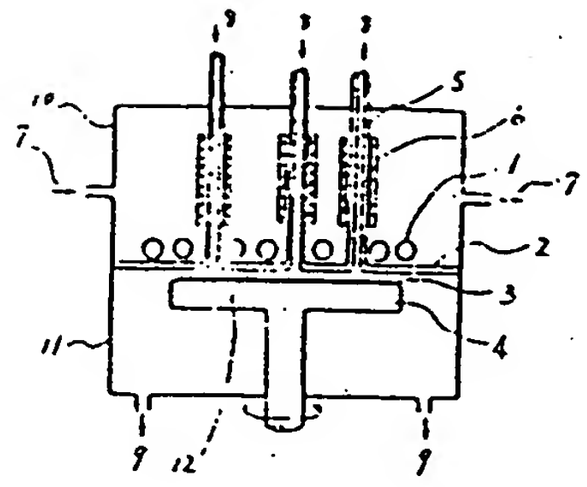
PURPOSE: To remove an organic substance at high speed and uniformly without increasing a temperature of a substance to be processed by a method wherein oxygen gas containing ozone is heated in advance and then flows and more than a prescribed amount of oxygen gas containing ozone which is heated and supplied flows from two or more places to a narrow space on the surface of the substrate by using a partition plate composed of an ultraviolet transmitting material.

CONSTITUTION: A UV-rays radiating discharge lamp 1 is arranged on a face whose area is larger than an area of a substrate 3 to be processed; inside a lamphouse 10, e.g., nitrogen gas is introduced from an inlet port 7 and is discharged from an outlet part 7'; a region around the lamp 1 is purged. Two or more quartz tubes 5 are arranged at a partition plate 2 composed of synthetic quartz; oxygen gas containing ozone is blown from inlet ports 8 onto the surface of the substrate 3 to be processed. The oxygen gas containing ozone is heated by using heaters 6 arranged around the quartz tubes 5. By this setup, an organic substance is removed at high speed and uniformly without increasing a temperature of the substrate to be processed so much; it is possible to prevent an impurity contained in the organic substance from being diffused into the substrate and a circuit.



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(54) Name of Invention: Cleaning Method for the Removal of Organic Matter
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Specifications

1. Name of Invention

Cleaning Method for the Removal of Organic Matter

2. Claims

1. A cleaning method for the removal of organic matter is characterized by the following: organic matter along the surface of a substrate that is to undergo a treatment process is decomposed and gasified

through the irradiation of ultraviolet light onto the substrate surface along with the delivery of oxygen gas containing ozone against said surface; the radiation source for said ultraviolet light is a low-pressure mercury lamp which is installed within a lamp housing that is purged with a gas that does not generate ozone; located between said lamp housing and the surface that is to undergo the treatment process is a partition plate made of material that can be penetrated by the ultraviolet light rays; oxygen gas containing heated ozone is delivered between this partition plate and the surface that is to undergo the treatment process; the substrate that is to be treated is positioned on top of a revolving stage so that it can be rotated during the treatment process.

2. The cleaning method for the removal of organic matter noted in Claim 1 is further characterized by the fact that the maximum temperature for the oxygen gas that contains the heated ozone is 150°C and the maximum temperature for the substrate that is to be treated is 250°C.

3. The cleaning method for the removal of organic matter noted in Claim 1 is further characterized by the fact that the quartz partition plate contains multiple quartz tubes used to deliver the oxygen gas containing the ozone. By heating the outside of these quartz tubes, the oxygen gas containing the ozone is heated to a specified temperature as it travels through the tubes.

4. The cleaning method for the removal of organic matter noted in Claim 1 is further characterized by the fact that the maximum distance between the quartz partition plate and the surface of the substrate that is to be treated is 0.5 mm. Given a surface area of the substrate S (cm^2) and a total flow rate V (cm^3/min.) of the oxygen containing the heated ozone, $V/S \geq 20$.

5. The cleaning method for the removal of organic matter noted in Claim 1 is further characterized by the fact that the revolving stage rotates a minimum of five times per minute during the treatment process.

3. Detailed Description of the Invention

<Industrial Field of Application>

This invention pertains to a cleaning method in which organic matter is removed, particularly with respect to the suitable removal of organic resist on top of a semiconductor wafer.

<Prior Art>

An example of a prior method is noted in Patent No. S58-015939, and this treatment method is known to call for the delivery of oxygen gas containing ozone onto the surface of a substrate that is to undergo treatment, as well as the irradiation of ultraviolet light onto this surface, with the maximum temperature of the substrate set to 260°C.

<Problem to be Solved by the Invention>

The prior art noted above does not take into consideration the dispersion of impurities from within the organic resist into the substrate circuit. Furthermore, this also does not consider the uniform cleaning and removal of organic matter from the substrate as a whole, which can cause a problem from the standpoint of production yield and uniformity of quality.

The purpose of this invention is to provide a new cleaning method for the removal of organic matter in which a reduction in quality due to the dispersion of impurities from within an organic material into a substrate circuit can be prevented and in which the treatment process can be conducted within a short amount of time and in a uniform fashion.

<Means for Solving the Problem>

One of the objectives noted above is achieved through the flow of a pre-heated oxygen gas for the delivery of the ozone included within the gas. Specifically, this objective is achieved when a specified amount of the oxygen gas containing the ozone that is delivered in a heated state is allowed to flow from several locations into the narrow spaces along the substrate surface by using a partition plate comprised of a material such as quartz, which can be penetrated by ultraviolet light rays.

<Operation>

The ultraviolet light rays have two functions, the first of which is to fragment the bonds within the organic matter, and the second of which is to decompose ozone in order to generate active oxygen. Through the heating and delivery of oxygen gas that contains ozone, the reactivity of the active oxygen atoms is increased, and at the same time, the temperature along the surface of the organic material is increased, resulting in active gasification of the organic matter. The ultraviolet light permeates the quartz partition plate to arrive at the

surface that is to undergo the treatment process. The preferred distance between the quartz partition plate and the surface to be treated is a maximum of 0.5 mm. Thus, the amount of absorption of ultraviolet light as a result of the ozone that is introduced between the two is controlled, which not only keeps the irradiation amount of ultraviolet light against the treatment surface from becoming too weak, but also generates active oxygen atoms near the treatment surface, making it easy for a reaction to occur between the organic matter and the active oxygen atoms. Given a surface area S (cm^2) of the treatment surface and a flow rate V (cm^3/min.) of the oxygen containing ozone, the delivery of oxygen gas containing heated ozone in which case $V/S \geq 20$ quickly causes the gas that is generated through the reaction with the organic material to be eliminated, making it easier for the newly generated active oxygen atoms to hit up against the new surface of the organic material. The oxygen gas containing the heated ozone is delivered from several exit ports onto the treatment surface. This combined with the rotation of the treatment surface results in a cleaning action in which organic material is removed at a uniform speed along the entire surface.

If the uniformity of the operation is poor, the portions of the surface in which the cleaning and removal of organic matter is quickly conducted will receive an extended amount of ultraviolet irradiation, resulting in high-energy damage within the substrate circuit that will cause a drop in the quality of the substrate circuit. This is why it is important to maintain a uniform cleaning and removal operation along the entire surface.

By maintaining a maximum temperature of 150°C for the oxygen gas containing the ozone as it is being delivered, this will prevent thermal decomposition of the ozone and will minimize the cooling of the surface as a result of the gas delivery, resulting in a high-speed cleaning and removal operation. By maintaining a maximum temperature of 250°C for the substrate that is undergoing treatment, it is possible to minimize the dispersion of impurities into the substrate circuit from within the organic matter located on the substrate surface.

<Embodiment>

The following is an embodiment of this invention in which Figure 1 is used for explanation. In Figure 1, the ultraviolet radiation lamp 1 covers a surface that is greater than the surface area of the treatment substrate 3. Within the lamp housing 10, nitrogen gas, for example, is taken in through the intake port 7 and sent out from the exit port 7′ in order to purge the area surrounding the lamp. A partition plate 2 comprised of a composite

quartz material is equipped with several quartz tubes 5, and oxygen gas containing ozone is drawn in through the intake port 8 such that it is applied to the surface of the treatment substrate 3. A heater 6 that is installed around the circumference of the quartz tubes 5 heats the oxygen gas containing the ozone. The distance between the quartz partition plate 2 and the surface of the treatment substrate 3 is set to 0.5 mm. The treatment substrate 3 is vacuum fit onto a revolving stage 4. The organic matter along the surface of the treatment substrate 3 reacts with the active oxygen, which was created by decomposing the ozone with ultraviolet light, and this organic matter is gasified to become CO_2, H_2O, etc., after which it is discharged through the exit port 9.

Here, the ultraviolet radiation lamp is a low-pressure mercury lamp with luminous tubes made from composite quartz that radiate light with wavelengths of 185 nm, 254 nm, etc. The average illumination of a light with a wavelength of 254 nm along the surface of the treatment substrate is 60 (mw/cm^2), and the temperature of the treatment substrate on the revolving stage is 250°C. The oxygen gas containing ozone at a level of 4% by volume is heated to 150°C, and this heated gas is emitted from three of the discharge ports onto a 5-inch wafer at a rate of 5,000 cm^3 per minute. This heated gas then flows through a space measuring 0.2 mm between the quartz partition plate and the surface of the substrate that is undergoing treatment. The revolving stage is set to rotate 10 turns per minute. In this case, the speed at which the organic resist is removed is 1.5 μ/min near the center of the wafer and 1.0 μ/min near the circumference of the wafer.

In the same fashion, when the temperature of the treatment substrate on the revolving stage is set to 250°C and the oxygen gas containing the ozone is not heated, the removal speed of the organic resist is 1.0 μ/min near the center of the wafer and 0.5 μ/min near the circumference of the wafer.

Then, in the case where the temperature of the treatment substrate on the revolving stage is set to 300°C and the oxygen gas containing the ozone is heated to a temperature of 150°C, the removal speed of the organic resist is 2.0 μ/min near the center of the wafer and 1.0 μ/min near the circumference of the wafer. However, in this case the impurities within the organic material (Na, K, etc.) become dispersed within the insulating silica layer, which is an unfavorable condition.

In the same fashion, when the temperature of the treatment substrate is set to 250°C and the oxygen gas containing the ozone is heated to a temperature of 150°C such that [the respective] V/S = 15 and 20, the respective removal speeds are 0.6 μ and 0.8 μ near the center of the wafer and 0.3 μ and 0.5μ near the circumference of the wafer. This provides a better condition since $V/S \geq 20$.

Furthermore, given a case in which the temperature of the treatment substrate is set to 250°C and the oxygen gas containing the ozone is heated to a temperature of 150°C such that V/S = 44, and given that one of the exit ports for the delivery of the oxygen gas is located near the center of the wafer, the removal speed of the organic matter is 1.5 μ/min near the center of the wafer and 0.2 μ/min near the circumference of the wafer, which indicates a poor level of uniformity.

Based on the above conditions, when three exit ports are used and [the respective] numbers of rotations of the revolving stage are 0, 3, and 5 per minute, the respective maximum values for the removal speed of the organic resist are 1.6, 1.3, and 1.2 μ/min, and the respective minimum values are 0.2, 0.3, and 0.5 μ/min. This makes it clear that the preferable number of rotations of the revolving stage is a minimum of five per minute.

As noted above, this embodiment has the effect of achieving a uniform removal of organic matter at a high speed without the need for heating the treatment substrate to a very high level, and since the treatment substrate does not have to be heated to a very high level, it becomes possible to effectively prevent the dispersion of impurities (particularly alkaline metals) onto the substrate and within the circuit from within the organic material.

<Effect of the Invention>

This invention provides a uniform removal of organic matter at a high rate of speed without increasing the temperature of the substrate that is to undergo treatment, and this makes it possible to provide a high-yield, high-quality method for the production of semiconductors in which the dispersion of impurities (such as alkaline metals) into the substrate circuit from within the organic resist material can be reduced.

4. Simple Explanation of the Drawing

Figure 1 is a conceptual drawing of the device used for the purpose of embodying this invention.

1: Ultraviolet radiation lamp

2: Quartz (composite quartz) partition plate

3: Treatment substrate (containing organic matter on the surface)

4: Revolving stage

5: Quartz tube

6: Heater

8: Intake port for oxygen gas containing ozone

12: Space between items 2 and 3

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Figure 1

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⑭発明の名称　有機物洗浄除去方法

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明　細　書

1．発明の名称

有機物洗浄除去方法

2．特許請求の範囲

1．有機物を表面に有した被処理基板の表面に、紫外線を照射するとともにオゾンを含む酸素ガスを供給して有機物を分解しガス化して洗浄除去する方法において、紫外線の放射源を低圧水銀放電灯とし、該放電灯はオゾンを発生しないガスでパージされたランプハウスに設置され、該ランプハウスと被処理表面との間には、紫外線透過性材料の仕切板を配置し、仕切板と被処理表面との間に、加熱されたオゾンを含む酸素ガスを供給し、被処理基板は、回転ステージ上にあつて、被処理基板が、処理期間中回転できるようにしたことを特徴とする有機物洗浄除去方法。

2．加熱供給するオゾンを含む酸素ガスの温度が150℃以下で、被処理基板の温度が250℃以下としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

3．石英仕切板に複数個のオゾンを含む酸素ガスを供給する石英管を有し、該石英管の外側を加熱することにより中を通るオゾンを含む酸素ガスを所定の温度に加熱することを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

4．石英仕切板と被処理基板の表面との間の距離が0.5㎝以下で被処理基板の面積をS(㎠)とし、加熱供給するオゾンを含む酸素ガスの全流量をV(㎤/分)としたとき、V/S≧20としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

5．処理中に回転ステージの回転数が毎分5回転以上としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

3．発明の詳細な説明

〔産業上の利用分野〕

本発明は、有機物の洗浄、除去方法に係り、特に半導体ウエハ上の有機レジストの除去に好適な方法に関する。

〔従来の技術〕

従来の方法としては、特公昭58－15939 号に記載のように、オゾンを含む酸素ガスを被処理基板表面上に供給しさらに紫外線を照射し、かつ被処理基板の温度を２６０℃以下とする処理方法が知られていた。

〔発明が解決しようとする問題点〕

上記従来技術は、有機レジスト中の不純物の基板回路中への拡散が配慮されておらず、また、基板全体の均一洗浄除去の点について配慮されておらず、製品の歩留及び品質の均一化に問題があった。

本発明の目的は、有機物中の不純物の基板回路への拡散による品質低下を防止するとともに均一に短時間に処理する簡易な有機物洗浄除去法を提供することにある。

〔問題点を解決するための手段〕

上記目的の１つは、供給するオゾンを含む酸素ガスを予め加熱して流すことにより達成され、また上記目的の今１つは、所定温以上の加熱供給されたオゾンを含む酸素ガスを供給することは、有機物と反応してできた生成ガスをすみやかに除去し新しい有機物の表面に新たに生成された活性酸素原子が当りやすくするように動作する。加熱されたオゾンを含む酸素ガスを複数個の出口より被処理表面上に供給することと、被処理基板を回転することは、表面全体の洗浄除去の速度を均一化するように動作する。

この均一化が悪いと、早く洗浄除去された部分は、長い時間、紫外線に照射されることによって基板回路内部への高エネルギー照射を受けて該基板回路の品質を低下させるので全体の均一洗浄除去は重要な要素である。

供給するオゾンを含む酸素ガスを１５０℃以下の雰囲にすることは、オゾンの熱分解のおきない範囲で、ガス供給により表面の冷却を少なくして洗浄除去のスピード早くするように動作し、被処理基板の温度を２５０℃以下にすることは、基板表面上の有機物中の不純物が基板回路内へ拡散すること少なくするように動作する。

るオゾンを含む酸素ガスを、例えば石英等の紫外線透過性材料からなる仕切板を用いて基板表面上の狭い空間に複数ケ所から流すことにより達成される。

〔作用〕

紫外線は、有機物の結合を切断する働きと供給するオゾンを分解して活性酸素を生成する働きを有する。オゾンを含む酸素ガスを加熱して供給することは、活性酸素原子の反応性を高め、同時に有機物表面の温度も高める作用をもち、有機物のガス化を活発にする。紫外線は石英仕切板を透過し、処理表面に到達する。石英仕切板と被処理表面との間の距離を好ましくは０．５㎜ 以下に配置する。これによって両者間に導入されるオゾンによる紫外線の吸収量を制御し、処理表面への紫外線の入射量を弱めすぎないようにするとともに、処理表面近くで活性酸素原子を生成させて有機物と活性酸素原子とを反応しやすくする。被処理表面の面積をＳ（㎠），オゾンを含む酸素の流量をＶ（㎤／分）とするときＶ／Ｓ≧２０以上の加熱

〔実施例〕

以下本発明の一実施例を第１図により説明する。第１図において、紫外線放射放電灯１は、被処理基板３の面積より大きい面に配置し、ランプハウス１０の中は、たとえば窒素ガスを注入口７から入れ流出口７′から出してランプ１のまわりをパージする。合成石英よりなる仕切板２には複数ケの石英管５を配設しており注入口８よりオゾンを含む酸素ガスを被処理基板３の表面上に吹きつける。オゾンを含む酸素ガスは、石英管５の周囲に配置したヒータ６により加熱される。石英板２と被処理基板３の表面との間の間隔は０．５㎜ 以下に設置される。被処理基板３は、回転可能なステージ４の上に真空吸着されている。被処理基板３の表面の有機物は、オゾン分解外線により分解してできた活性酸素と反応し、ＣＯ₂やＨ₂Ｏ等にガス化して流出口９により排気される。

ここで、紫外線放射放電灯からは、波長１８５ｎｍ，２５４ｎｍ等が放射される合成石英を発光管とし低圧水銀灯で、被処理基板表面での２５４

nmの平均照度が60（mW／cm²）．回転ステージ上の被処理物の温度を250℃．オゾンを4体積パーセント含む酸素ガスを150℃に加熱して，毎分5000cm³，5インチのウエハ上に3本の吹き出し口から流出させ，石英板と被処理基板表面との間隔が0.2mmの間を通して流した．回転ステージの回転数は毎分10回転とした．このときの有機物レジストの除去スピードはウエハ中心付近で1.5μ／分，ウエハ周辺付近で1.0μ／分であつた．

同様に，回転ステージ上の被処理物の温度を250℃とし，供給するオゾンを含む酸素ガスを加熱しないときの有機物レジストの除去スピードは，ウエハ中心付近で1.0μ／分，周辺付近で0.5μ／分であつた．

さらに，回転ステージの被処理物の温度を380℃，供給するオゾンを含む酸素ガスの温度を150℃としたときには，有機レジストの除去スピードは，ウエハ中心付近で2.0 μ／分周辺付近で1μ分であつたが，有機物中の不純物（Na，K等）が絶縁シリカ膜へ拡散して不良となつた．

同様に，被処理基板の温度を250℃，供給するオゾンを含む酸素がこの温度を150℃としてV／S＝15，20としたときの中心付近の有機レジストの除去スピードは，それぞれ0.5，0.8μ分．周辺付近のそれは0.3，0.5μ／分であつた．このことからV／S≧20を満たす方がよい．

さらにまた，同様に被処理基板の温度を250℃，供給ガスの温度を150℃，V／S＝44で，供給する流出口をウエハ中心付近の1本にしたときの有機物の除去速度は，中心付近で1.5 μ／分，周辺付近で，0.2 μ／分で均一性が悪かつた．

上記条件で，流出口を3本としたときで回転ステージの回転数を毎分0，3，5としたところ有機レジストの除去速度の最大値は，それぞれ1.6，1.3，1.2μ／分，最少値は，0.2，0.3，0.5μ／分であつた．すなわち回転ステージの回転数は毎分5回転以上が望ましいことが判つた．

以上のように本実施例によれば，被処理基板そのものの温度をあまり高くしないで，高スピードの有機物の除去が均一に得られる効果があり，被処理基板の温度をあまり高くしないことによつて有機物中に含まれる不純物（特にアルカル金属）の基板，回路内への拡散を防止する効果がある．

（発明の効果）

本発明によれば，被処理基板の温度を上げないで高スピードに有機物の除去を均一にできるので有機レジスト中に含有する不純物（アルカリ金属等）の基板回路への拡散を低減でき高歩留，高品質の半導体を製造できる効果がある．

4．図面の簡単な説明

第1図は，本発明を実施するための装置の概念図である．

1…紫外線放射管灯，2…石英（合成石英）仕切板，3…被処理基板（表面に有機物あり），4…回転ステージ，5…石英管，6…ヒータ，8…オゾンを含む酸素ガスの流入口，12…2と3の間の間隔．

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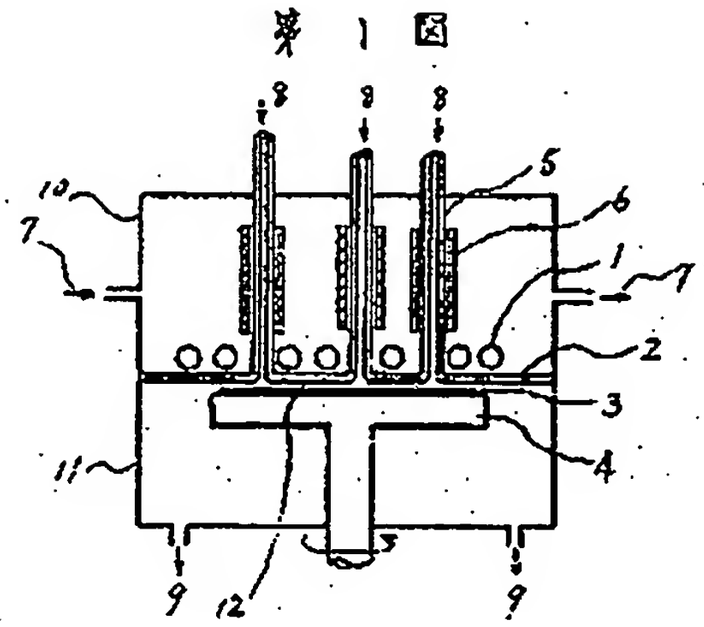
第1図



(54) CLEANING AND REMOVAL OF ORGANIC SUBSTANCE
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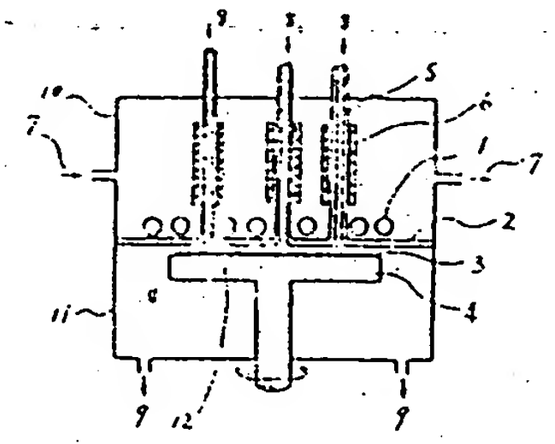
PURPOSE: To remove an organic substance at high speed and uniformly without increasing a temperature of a substance to be processed by a method wherein oxygen gas containing ozone is heated in advance and then flows and more than a prescribed amount of oxygen gas containing ozone which is heated and supplied flows from two or more places to a narrow space on the surface of the substrate by using a partition plate composed of an ultraviolet transmitting material.

CONSTITUTION: A UV-rays radiating discharge lamp 1 is arranged on a face whose area is larger than an area of a substrate 3 to be processed; inside a lamphouse 10, e.g., nitrogen gas is introduced from an inlet port 7 and is discharged from an outlet part 7' ; a region around the lamp 1 is purged. Two or more quartz tubes 5 are arranged at a partition plate 2 composed of synthetic quartz; oxygen gas containing ozone is blown from inlet ports 8 onto the surface of the substrate 3 to be processed. The oxygen gas containing ozone is heated by using heaters 6 arranged around the quartz tubes 5. By this setup, an organic substance is removed at high speed and uniformly without increasing a temperature of the substrate to be processed so much; it is possible to prevent an impurity contained in the organic substance from being diffused into the substrate and a circuit.



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	21/302		B-8223-5F	
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㊹発明の名称　有機物洗浄除去方法

㉑特　願　昭62-198075

㉒出　願　昭62(1987)8月10日

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明　細　書

1．発明の名称

有機物洗浄除去方法

2．特許請求の範囲

1．有機物を表面に有した被処理基板の表面に、紫外線を照射するとともにオゾンを含む酸素ガスを供給して有機物を分解しガス化して洗浄除去する方法において、紫外線の放射源を低圧水銀放電灯とし、該放電灯はオゾンを発生しないガスでパージされたランプハウスに設置され、該ランプハウスと被処理表面との間には、紫外線透過性材料の仕切板を配置し、仕切板と被処理表面との間に、加熱されたオゾンを含む酸素ガスを供給し、被処理基板は、回転ステージ上にあって、被処理基板が、処理期間中回転できるようにしたことを特徴とする有機物洗浄除去方法。

2．加熱供給するオゾンを含む酸素ガスの温度が150℃以下で、被処理基板の温度が250℃以下としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

3．石英仕切板に複数個のオゾンを含む酸素ガスを供給する石英管を有し、該石英管の外側を加熱することにより中を通るオゾンを含む酸素ガスを所定の温度に加熱することを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

4．石英仕切板と被処理基板の表面との間の距離が0.5㎜以下で被処理基板の面積をS(㎠)とし、加熱供給するオゾンを含む酸素ガスの全流量をV(㎤/分)としたとき、V/S≧20としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

5．処理中に回転ステージの回転数が毎分5回転以上としたことを特徴とする特許請求の範囲第1項記載の有機物洗浄除去方法。

3．発明の詳細な説明

(産業上の利用分野)

本発明は、有機物の洗浄、除去方法に係り、特に半導体ウエハ上の有機レジストの除去に好適な方法に関する。

nmの平均照度が60（mw／cd）、回転ステージ上の被処理物の温度を250℃、オゾンを4体積パーセント含む酸素ガスを150℃に加熱して、毎分5000cc、5インチのウエハ上に3本の吹き出し口から流出させ、石英板と被処理基板表面との間隔が0.2mmの間を通して流した。回転ステージの回転数は毎分10回転とした。このときの有機物レジストの除去スピードにウエハ中心付近で1.5μ／分、ウエハ周辺付近で1.0μ／分であつた。

同様に、回転ステージ上の被処理物の温度を250℃とし、供給するオゾンを含む酸素ガスを加熱しないときの有機物レジストの除去スピードは、ウエハ中心付近で1.0μ／分、周辺付近で0.5μ／分であつた。

さらに、回転ステージの被処理物の温度を300℃、供給するオゾンを含む酸素ガスの温度を150℃としたときには、有機レジストの除去スピードは、ウエハ中心付近で2.0μ／分周辺付近で1μ分であつたが、有機物中の不純物（Na，K等）が絶縁シリカ膜へ拡散して不良となつた。

同様に、被処理基板の温度を250℃、供給するオゾンを含む酸素がこの温度を150℃として V／S＝15，20としたときの中心付近の有機レジストの除去スピードは、それぞれ0.6，0.8μ分、周辺付近のそれは0.3，0.5μ／分であつた。このことからV／S≧20を満たす方がよい。

さらにまた、同様に被処理基板の温度を250℃、供給ガスの温度を150℃、V／S＝44で、供給する流出口云ウエハ中心付近の1本にしたときの有機物の除去速度は、中心付近で1.5μ／分、周辺付近で、0.2μ／分で均一性が悪かつた。

上記条件で、流出口を3本としたときで回転ステージの回転数を毎分0，3，5としたところ有機レジストの除去速度の最大値は、それぞれ1.6，1.3，1.2μ／分、最少値は、0.2，0.3，0.5μ／分であつた。すなわち回転ステージの回転数は毎分5回転以上が望ましいことが判つた。

以上のように本実施例によれば、被処理基板そのものの温度をあまり高くしないで、高スピードの有機物の除去が均一に得られる効果があり、被処理基板の温度をあまり高くしないことによつて有機物中に含まれる不純物（特にアルカル金属）の基板、回路内への拡散を防止する効果がある。

〔発明の効果〕

本発明によれば、被処理基板の温度を上げないで高スピードに有機物の除去を均一にできるので有機レジスト中に含有する不純物（アルカリ金属等）の基板回路への拡散を低減でき高歩留、高品質の半導体を製造できる効果がある。

4．図面の簡単な説明

第1図は、本発明を実施するための装置の概念図である。

1…紫外線放射放電灯、2…石英（合成石英）仕切板、3…被処理基板（表面に有機物あり）、4…回転ステージ、5…石英管、6…ヒータ、8…オゾンを含む酸素ガスの流入口、12…2と3の間の間隔。

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